

PATENT
Attorney Docket No. 401042/Lee

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

TADAO YAMAGUCHI

Application No. 09/770,383

Art Unit: 2834

Filed: January 29, 2001

Examiner: B. Mullins

For: NON-CIRCULAR,
FLAT MOTOR AND
MANUFACTURING
METHOD THEREOF

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**PENDING CLAIMS AFTER AMENDMENTS
MADE IN RESPONSE TO OFFICE ACTION DATED MARCH 27, 2002**

1. A non-circular flat motor comprising:

a rotor;

a housing which is non-circular in a plane perpendicular to the axial direction, which rotatably supports the rotor, and which has side surfaces, at least a part of which are flat and including a stator base;

an armature coil at the stator base;

a magnet on the rotor facing the armature coil and spaced from the armature coil by a gap; and

a plurality of feeder terminals arranged at the side surface at corners of the housing and electrically insulated from adjacent portions of the motor.

3. The motor as claimed in claim 1, wherein the housing is substantially rectangular in the plane and at least some of the feeder terminals do not protrude outwardly from the housing beyond sides of the housing.

4. The motor as claimed in claim 1, further comprising:

a flat magnet;

a bracket as part of the housing and on which the magnet is disposed; and

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a pair of brushes, at least one of the brushes being connected to the feeder terminals through a first gap between the bracket and the magnet as insulation, wherein the rotor receives electric power via the brushes and faces the flat magnet across a second gap in the axial direction.

5. The motor as claimed in claim 4, wherein a base end of one of the brushes is part of the feeder terminal.

6. The motor as claimed in claim 4, wherein the housing is substantially rectangular in the plane and at least some of the feeder terminals do not protrude outward beyond the corners of the housing.

7. A non-circular flat motor comprising:

a rotor;

a stator base having a shaft for supporting the rotor and centrally located on the stator base;

a housing having a metal portion and a non-circular shape in a plane perpendicular to the axial direction, and being at least partially a resin; and

at least two feeder terminals arranged at a corner of the housing on a side surface of the housing, electrically insulating the feeder terminals from the metal portion of the housing.

8. The motor as claimed in claim 7, wherein the shaft has a fixed shaft core extending from a portion of the housing constituting a stator, the shaft core having a resin coating, the rotor is rotatably installed on the resin coated fixed shaft, and a tip of the shaft is inserted in a concave portion of the housing.

9. The motor as claimed in claim 8, further comprising:

a magnet;

a magnetic yoke plate, the shaft core integrally protruding from the center of the magnetic yoke plate, constituting part of the housing;

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a bracket including the resin coated fixed shaft and incorporating at least part of the magnetic yoke plate;

a rotor including a commutator and an armature coil having an end connected to the commutator and rotatably supported by the resin coated, fixed shaft, facing the magnet and spaced from the magnet by a gap;

a pair of brushes having base ends and contacts in sliding contact with the commutator and fixed such that at least two surfaces of the base ends are exposed to the bracket;

a brush recess insulating at least one of the brushes from the magnetic yoke plate;
and

an armature coil having one end connected to the commutator and rotatably arranged at the resin coated, fixed shaft, facing a magnet across a gap, wherein the magnet is placed at a yoke portion of the bracket after the brushes are installed; and

a case accommodating the rotor and having a concave portion at the bracket and receiving the tip of the resin coated fixed shaft centrally in the case, at least a magnetic path portion of the magnet being a magnetic body.

10. The motor as claimed in claim 9, wherein the magnet is separated from the yoke plate by a gap to enable reflow soldering.

11. The motor as claimed in claim 10, wherein the magnetic yoke plate is separated from the case except for a combined portion.

12. The motor as claimed in claim 11, wherein a portion for reflow soldering is not close to the combined portion.

13. The motor as claimed in claim 9, wherein the resin of the resin coated fixed shaft include a potassium titanate whisker and withstands a thermal deformation temperature of over 200°C (18.5 kgf/cm²) and is slippery.

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14. The motor according to claim 1, comprising:
a metal plate incorporating a shaft support at a center, forming a first part of the housing;
a fixed shaft supported by the shaft support the rotor being rotatably installed at a tip of the fixed shaft; and
a plurality of armature coils arranged around the fixed shaft to drive the rotor, wherein a second part of the housing supports the tip of the fixed shaft.
15. The motor as claimed in claim 14, wherein the fixed shaft has a shaft core cut from a metal plate and the shaft core is coated with resin.
16. The motor as claimed in claim 14, including a pinion incorporated in the rotor and accommodated in the housing.
17. The motor as claimed in claim 1, wherein the rotor is eccentric to generate vibrations during rotation.
18. The motor as claimed in claim 7, wherein the rotor is eccentric to generate vibrations during rotation.
19. The motor as claimed in claim 4, wherein the rotor is eccentric to generate vibrations during rotation.